Original Article

Incidence of early post thyroidectomy hypocalcaemia effect of bilateral ligation of the inferior thyroid arteries, type of operation and surgeon experience

Elmirghani Ahmed [1], Alkanzi K A[2] and Elfadeel Yahya M A[3]

Abstract:-

Background and aims: Early hypocalcaemia is a common complication following thyroid surgery. Objectives: The objectives of this paper are to identify the incidence and fate of early post thyroidectomy hypocalcaemia, and to study its relation to bilateral ligation of the inferior thyroid arteries, to the type of the operation, and the operator experience.

Materials and method: In this prospective study fifty patients who underwent thyroidectomy between May 2010 and May 2011 at Omdurman teaching hospital were evaluated. Information regarding age, sex, operative details, and serum calcium level (pre operatively, one day and after one week postoperatively) were collected.

Results: The incidence of postoperative hypocalcaemia was about 22%. During one week serum calcium level returned to normal without calcium replacement therapy except in three patients. Early post thyroidectomy hypocalcaemia occurred in 38.5% of patients who underwent total thyroidectomy which represents 10% of all patients who developed hypocalcaemia (P=, 2). Ligation of the inferior thyroid arteries was done in 23 patients, four of them (17, 4%) (8% of all) developed postoperative hypocalcaemia (P=, 4). Registrars operated on thirty patients. Six of them (20%) (12%of all) developed low calcium level (P=, 7).

Conclusion: Transient post thyroidectomy hypocalcaemia was a common complication following thyroid operations. Total thyroidectomy increases the risk of postoperative hypocalcaemia, while ligation of the inferior thyroid arteries and operations done by registrars (once the technique is mastered) did not increase this risk.

Keywords: hypoparathyroidism, hypoparathyroidism.

THYROIDECTOMY is a common operation performed by general and head and neck surgeons. Ischaemia and damage to the parathyroid glands is one of its complications which can leads to postoperative hypocalcaemia[1].

The reported incidence of post thyroidectomy hypoparathyroidism ranges from less than 1 to 15 % [2, 3]. This may be due to a variety of factors, such as injury, devascularization of the parathyroid glands, and accidental removal of one or more parathyroid glands. The aim of this study is to evaluate the incidence and fate of the early post thyroidectomy hypocalcaemia in operations done in a general surgical unit at Omdurman Teaching Hospital during the period May 2010 to May 2011. Our goals are to identify the incidence of early post thyroidectomy hypocalcaemia and its fate and to investigate whether there is an association between the bilateral ligation of the inferior thyroid arteries and the occurrence of postoperative hypocalcaemia. This study also identified the reflection of operator experience and the type of operation on the development of this complication.

1. Associate professor department of surgery. Faculty of medicine-Omdurman Islamic university. Sudan.
2. Assistant professor department of surgery. Faculty of medicine-Omdurman Islamic university. Sudan.
3. Registrar of general surgery SMSB .Sudan
Correspondence to: aelmirghani@gmail.com

Patients and Methods:-

This is a prospective study which was conducted at Omdurman Teaching Hospital in a general surgical unit. A planned questionnaire was designed and data concerning the age and gender of patients, type of operation, ligation of the inferior thyroid arteries or not and the operator level were gathered in 50 patients who underwent

thyroidectomy during the period from May 2010 to May 2011.

Data were gathered regarding postoperative biochemical and clinical hypocalcaemia. Serum calcium levels were measured preoperatively, in the first postoperative day and after one week if it was low at the first measures. Hypocalcaemia was defined as serum calcium level < 2mmol/l (8mg/dl).

Data were analyzed using the Statistical Package for Social Sciences (SPSS, version 17), and were described using frequencies and percentages. Univariate analysis was conducted using Chi-square test.

Results:-

The study included fifty patients all were females. The main age at which these operations were carried out was between 41-45 years which represents 32% of the group (Table 1).

Table 1:- Age groups and hypocalcaemia.

Age group	Frequency	Percent
20-25	1	2.0
26-30	3	6.0
31-35	3	6.0
36-40	14	28.0
41-45	16	32.0
46-50	13	26.0

The main objective of the study is to identify the incidence of early post thyroidectomy hypocalcaemia and its fate. The study showed that it occurred in only eight (22%) patients postoperatively. It returned to the normal range after one week postoperatively without calcium replacement therapy except in three patients. Two of them received calcium therapy for short duration and stopped it by themselves and their blood calcium returned to normal. The third patient remained on calcium therapy and developed clinical signs of hypocalcaemia.

Early post thyroidectomy hypocalcaemia occurred in 38.5% of patients who underwent total thyroidectomy which represents 10% of all patients who developed hypocalcaemia (P= 0.2) (Table 2).

Ligation of the inferior thyroid arteries was done in 23 patients four of them (17.4%) developed postoperative hypocalcaemia (P=0.4). Inferior thyroid artery was not ligated in 27 patients and seven of them (25.9%) developed hypocalcaemia.

Registrars operated on thirty patients, six of them (20%) developed low calcium level (P=0.7) .On the other hand, consultant surgeons did twenty operations, five of them (25%) developed postoperative hypocalcaemia.

Table 2:- Early calcium level in relation to type of operations

Type of operation	hypocalcaemia	normal calcium	Total	Percentage of hypocalcaemia
Total thyroidectomy	5	8	13	38.5%
Near total thyroidectomy	2	8	10	20%
Subtotal thyroidectomy	4	23	27	15%

Discussion:-

Iatrogenic hypoparathyroidism is a common complication after thyroidectomy. In the literature, the incidence of incidental parathyroidectomy during thyroid surgery ranges from 8 to 19%[4,5]. Although experienced thyroid surgeons have emphasized the importance of parathyroid identification and preservation during thyroidectomy[6,7], nevertheless, despite taking the greatest possible care to localize, dissect, and preserve the parathyroid glands, hypocalcaemia may ensue. Using the most common definition of hypocalcaemia serum calcium level below 8 mg/dl (2 mmol/l) on the first day after surgery, the prevalence ranges from 16 to 55 per cent[8,9]. Low rates of hypocalcaemia (less than 30 per cent) are usually reported when a lower serum calcium threshold (7·6 mg/dl) is used to define hypocalcaemia.

This study showed that the incidence of early post thyroidectomy hypocalcaemia occurred in 22% of our patients who underwent different types of thyroidectomy. A study done by Lin DT and Sakorafas GH showed that the incidence of hypocalcaemia during thyroid surgery ranges from 8 to 19%[5].

Biochemical and clinical follow up of our patients serum calcium level shows that it returned to normal range within one week without calcium replacement therapy, except in three patients who needed calcium therapy due to their clinical presentation. This transient hypocalcaemia may be due to transient ischaemic insult before collateral circulation has taken place.

Two of these patients stopped the treatment by themselves and the blood test revealed normal calcium level, and this is keeping with the study done by Hins and Jacobs which shows that permanent hypoparathyroidism can occur in 1%–5% of patients after bilateral subtotal resection, and its incidence is higher after total thyroidectomy[10,11].

In this study early post thyroidectomy hypocalcaemia occurred mainly after total thyroidectomy reaching 38.5%, while it was 20% and 15% after near total and subtotal respectively. Total thyroidectomy may put the parathyroid glands at a greater risk of damage or removal than when some thyroid tissue is preserved.

Halsted and Evans[12] showed that parathyroid arteries are the end arteries arising from the inferior thyroid artery and to preserve parathyroid circulation the inferior thyroid arteries should not be ligated during thyroid surgery. However Curtis[13] showed that anastomosis between branches of the parathyroid arteries and the thyroid remnant could be enough to preserve tissue perfusion. Wade et al.[14] suggested that there would be no risk to parathyroid tissue from ligating the trunk of the inferior thyroid arteries.

Some concluded that truncal ligation of the inferior thyroid arteries during bilateral subtotal thyroidectomy for non-toxic nodular goitre did not cause an increased risk of postoperative hypoparathyroidism[15, 16].

This is keeping with this study as the percentage of patients who developed hypocalcaemia was significantly higher when the inferior thyroid arteries were not ligated (25.9%) than when they were ligated (17.4%). This result is also keeping with study done by others that showed truncal ligation of the inferior thyroid arteries during bilateral subtotal thyroidectomy has no effect on the incidence of hypocalcaemia after thyroidectomy[17].

Runkel and Wade stated that thyroidectomy may be safely performed by residents under the supervision of an experienced surgeon[14, 18].

This study documented no statistical deference on complication of thyroidectomy between operators in different level of experience once the technique is mastered by good supervision of skilled surgeons. In this study registrars operated on thirty patients, six (20%) (12% of all) of them developed low calcium level .On the other hand, consultant surgeons operated on twenty patients, five (25%) of them developed postoperative hypocalcaemia. These findings goes as well with a study done elsewhere that showed with proper training and supervision residents can safely and effectively perform thyroidectomy with acceptable complication rates [19].

Conclusion:-

Transient post thyroidectomy hypocalcaemia was a common complication following thyroid operations. Follow up of patients showed that the majority of them return to the normal calcium range in less than one week duration without calcium replacement therapy.

The incidence of early postoperative hypocalcaemia was increased after total thyroidectomy. No statistical difference was found between operators of different levels once the technique is mastered.

Bilateral ligation of the inferior thyroid artery did not increase the risk of early post thyroidectomy hypocalcaemia. Our results in this study are close to those achieved internationally

References:-

1. Shindo ML, Sinha UK, Rice DH. Safety of thyroidectomy in residency: a review of 186 consecutive cases. Laryngoscope 1995; 105: 1173–1175.
2. Pattou F, Combemale F, Fabre S et al. Hypocalcaemia following thyroid surgery: incidence and prediction of outcome. World J Surg 1998; 22:718–724.
3. Shaha AR, Jaffe BM. Parathyroid preservation during thyroid surgery. Am J Otolaryngology 1998; 19:113–117.
4. Lin DT, Patel SG, Shaha AR et al. Incidence of inadvertent parathyroid removal during thyroidectomy. Laryngoscope 2002; 112:608–611.
5. Sakorafas GH, Stafyla V, Bramis K et al. Incidental parathyroidectomy during thyroid surgery. An underappreciated complication of thyroidectomy. World J Surg 2005; 29:1539–1543.
6. Shaha AR, Jaffe BM. Parathyroid preservation during thyroid surgery. Am J Otolaryngology 1998; 19:113–117.
7. Bergamaschi R, Becouarn G, Ronceray J et al. Morbidity of thyroid surgery. Am J Surg 1998; 176:71–75.
8. Bhattacharyya N, Fried MP. Assessment of the morbidit``nd complications of total thyroidectomy. Arch Otolaryngol Head Neck Surg 2002; 128: 389–392.
9. Abboud B, Sargi Z, Akkam M et al. Risk factors for postthyroidectomy hypocalcaemia. J Am Coll Surg 2002; 195: 456–461.
10. Hines JR, Atiyah R, Kliefoth J et al. Hyperparathyroidism: problems in surgical management. Am J Surg 1982; 144: 504–510.
11. Jacobs JK, Aland JW, Ballinger JF. Total thyroidectomy: a review of 213 patients. Ann Surg 1983; 197: 542–549.
12. Halsted WS, Evans HM. The parathyroid glandules. Their blood supply and their preservation in operation upon the thyroid gland. Ann Surg 1907; 46: 489–506.
13. Curtis GM. The blood supply of the human parathyroids. Surg Gynecol Obstet 1930; 51: 805–809.
14. Wade JSH, Goodall P, Deane L et al. The course of partial parathyroid insufficiency after thyroidectomy.Br J Surg 1965; 52: 497–503.
15. Nies C, Sitter H, Zielke A, et al. Parathyroid function following ligation of the inferior thyroid arteries during bilateral subtotal thyroidectomy. Br J Surg 1994; 81: 1757–1759.
16. Cakmaklı S, Aydıntug S, Erdem E. Post-thyroidectomy hypocalcemia: does arterial ligation play a significant role? Int Surg 1992; 77: 284–286.
17. Mete Dolapc, Mutlu Dog˘anay, Erhan Reis et al. Truncal Ligation of the Inferior Thyroid Arteries does not Affect the Incidence of Hypocalcaemia after Thyroidectomy From the 4th Department of Surgery, Ankara Numune Hospital, Ankara, Turkey Eur J Surg 2000; 166: 286–288.
18. Runkel N., Riede E., Mann B. et al. Surgical training and vocal-cord paralysis in benign thyroid disease. Langenbecks. Arch. Surg. 1998; 383: 240–242.
19. Erbil,Barboars Predictive factors for recurrent laryngeal nerve palsy and hypoparathyroidism after thyroid surgery Departments of General Surgery, Health Public, Radiology, and Pathology, Istanbul Medical Faculty, Istanbul Clin. Otolaryngol. 2007; 32: 32–37.